

INSTRUCTION MANUAL



HIGH-FREQUENCY LIMIT LEVEL SENSOR RFLS-28



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USED SYMBOLS

To ensure maximum safety of control processes, we have defined the following safety instructions and information. Each instruction is labelled with the appropriate pictogram.



Alert, warning, danger

This symbol informs you about particularly important instructions for installation and operation of equipment or dangerous situations that may occur during the installation and operation. Not observing these instructions may cause disturbance, damage or destruction of equipment or may cause injury.



Information

This symbol indicates particularly important characteristics of the device.



Note

This symbol indicates helpful additional information.

SAFETY



All operations described in this instruction manual have to be carried out by trained personnel or by an accredited person only. Warranty and post warranty service must be exclusively carried out by the manufacturer.

Improper use, installation or settings of the sensor can lead to crashes in the application (overfilling the tank or damage to system components).

The manufacturer is not responsible for improper use, loss of work caused by either direct or indirect damage, and for expenses incurred at the time of installation or during the period of use of the sensor.

1. BASIC DESCRIPTION

The **high-frequency level sensor RFLS-28** is designed for industrial use for limit sensing of the level of liquid and paste-like media. The high-frequency level sensor may be a direct replacement of a vibrating level sensor, or of a capacitive level sensor in case of more demanding applications. The media may be electrically conductive or non-conductive with any permittivity. It can be installed in metal or plastic tanks, pipes, filling tanks, sumps, etc. using the TN-28 extension tube, or similar.

The sensor works in the high frequency band, enabling reliable detection of the level of media, and eliminating deposits or foam on the electrode. The sensor suppresses the influence of deposits of viscous media (ketchup, yoghurt, pastes, syrups, jams and jellies, creams, soap) as well as electrically conductive adhesive products (detergents, lye, chemicals).

The sensor can be set by applying a magnetic pen to sensitive surfaces, or by means of a programming wire (variant RFLS-28 _ _ _ - PD _ - MW). For sensors with the possibility of remote parameterization, only basic settings (resolution of two interfaces) can be performed. A special evaluation unit SSU-1212-AD must be used for remote parameterization of the sensor.

The sensor can be set up by applying a magnetic pen to sensitive spots.

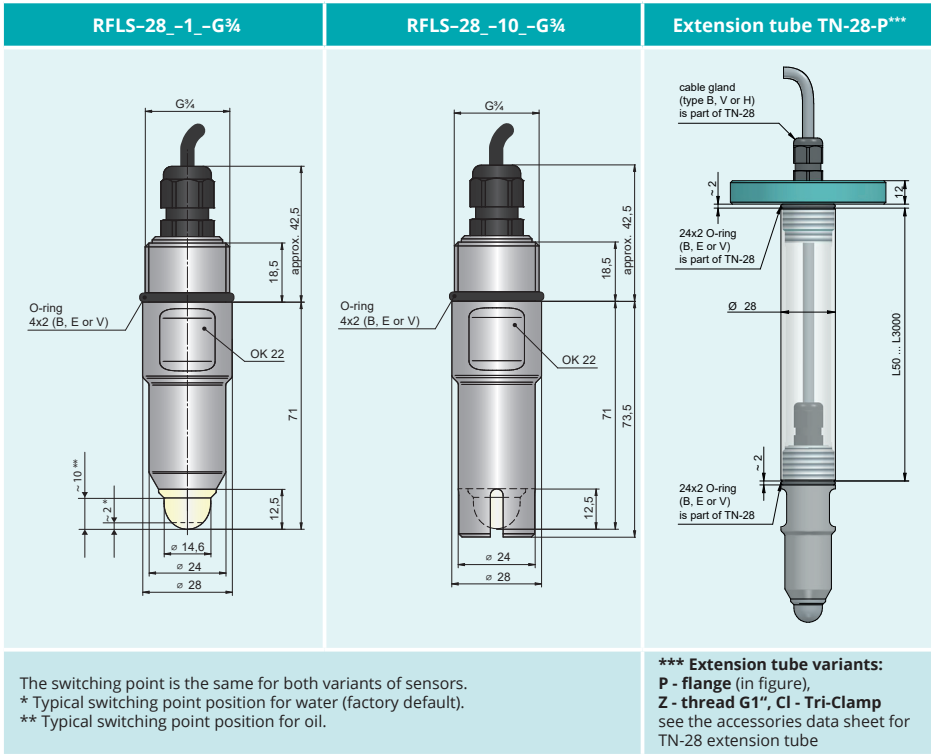
- simple sensing of the presence of the medium (medium / air)
- resolution of the interface of two media (medium / medium), e.g. water / oil
- selective resolution of a specific medium (Medium window function), the function can distinguish e.g. oil from water and air, detect only beer foam and ignore beer and air, etc.

The sensor is made from a stainless steel housing at one end terminated by a sensing electrode, and terminated at the other end and by an enclosure with a status indicator, control elements and electrical connection. The setting elements are on the sides of the sensor. The sensors are manufactured only for use in non-explosive areas.

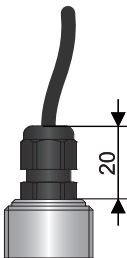
2. VARIANTS OF SENSORS

VARIANTS		
name	minimum temperature	type
RFLS-28_1B	from -40°C	O-ring NBR, for sensing various liquids, mashed and paste-like materials, appropriate also for oil
RFLS-28_10B	from -40°C	with protective crown, O-ring NBR, for sensing various liquids, mashed and paste-like materials, appropriate also for oil
RFLS-28_1E	from -40°C	O-ring EPDM, for sensing various liquids, mashed and paste-like materials, appropriate also for acids or bases
RFLS-28_10E	from -40°C	With protective crown, O-ring EPDM, for sensing various liquids, mashed and paste-like materials, appropriate also for acids or bases
RFLS-28_1V	from -20°C	O-ring FPM (Viton), for sensing various liquids, mashed and paste-like materials, appropriate also for oil, acids, bases or asphalt and tar
RFLS-28_10V	from -20°C	with protective crown, O-ring FPM (Viton), for sensing various liquids, mashed and paste-like materials, appropriate also for oil, acids, bases or asphalt and tar

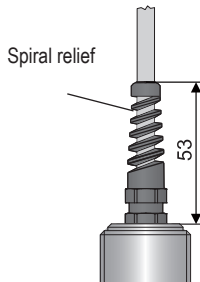
3. DIMENSIONAL DRAWINGS



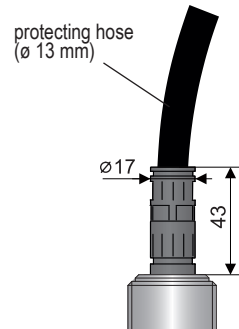
Variant "B"
with standard cable gland



Variant "V" with plastic cable gland with spiral relief - in the case of increased mechanical wear on the cable.



Variant "H" with cable gland for protecting hoses - for use in an outdoor area or in area with high humidity.



4. INSTALLATION AND PUTTING INTO OPERATION

This procedure has the following three steps:

- **ELECTRICAL CONNECTION** see Chapter 5
- **SETTINGS** see Chapter 6
- **MECHANICAL ASSEMBLY** see Chapter 9

5. ELECTRICAL CONNECTION

A sensor with PNP output can be loaded only by resistive or inductive load. The capacitive loads and low resistance loads (bulb) are evaluated by the sensor as a short circuit.

Connection diagrams are listed in Figure below.

The RFLS-28 sensors are connected to evaluation units permanently by a PVC cable.

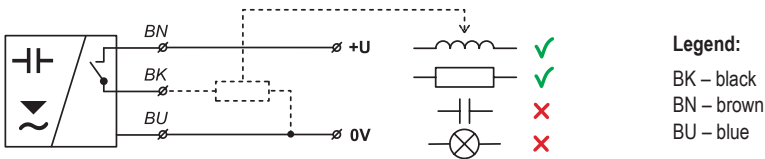


Fig. 1: Sensor connection with PNP output, without programming cable

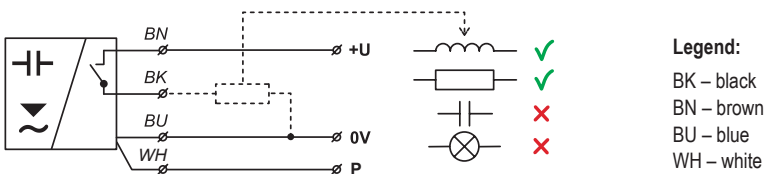


Fig. 2: Sensor connection with PNP output, with programming cable



Electrical connection can only be made when de-energized!

The power supply must be designed as a stabilized source of low safe voltage with galvanic isolation. If a switched power supply is used, its design must effectively suppress common mode interference. If the switched power supply is equipped with a PE protective terminal, it must be earthed without fail!



If the level meter (sensor) is to be installed in an outdoor environment more than 20 m from an outdoor switchboard or an enclosed building, the electrical supply to the level meter (sensor) must be supplemented with suitable overvoltage protection.

In case of a strong environmental electromagnetic interference, common routing of the signal cable with power cable or in case of more than 30 m length, we recommend using a shielded cable and grounding the shielding on the power source side.

6. SETTINGS



The settings must be made before installing the sensor in the TN-28 tubular extender..

When setting up the RFLS-28 sensor, it is necessary to monitor the signalling of both LEDs, therefore it is necessary to make settings before installing the sensor in the tank.


SETUP INSTRUCTIONS:

- Make the electrical connection of the sensor - see chapter 5
- In the case of simple detection of non-adhesive medium, it is possible to use the Quick settings according to chap. 6.1. Otherwise, **it is necessary to make settings with the presence of medium.**
- Prepare the measured medium in the auxiliary vessel.
- If you want to detect the presence of a medium (medium / air) or to detect the interface of two different media (medium / medium), eg water / oil, follow chap. 6.2 Basic settings
- If you want to selectively detect a specific medium, follow chap. 6.3 Settings "Medium window" mode.


6.1. QUICK SETTINGS

This mode is only suitable for verifying the sensor before start-up if the measured medium is not available.

A) SETTING THE MODE O (WITHOUT THE POSSIBILITY OF USING THE MEDIUM)

1. The sensor is turned with the measuring electrode into the free space.
2. Apply the magnetic pen for **5 - 10 seconds** to the sensitive spot  of the sensor (at first both LEDs light up, after approx. 3 seconds the orange LED flashes 3 times, and after another approx. 2 seconds the orange LED flashes again 3 times - now you can remove the magnetic pen. The sensor is now set to the mode O (closes when submerged).

B) SETTING THE MODE C (IT IS OPEN WHEN SUBMERGED)

1. The sensor is turned with the measuring electrode into the free space.
2. Apply the magnetic pen for **5 - 10 seconds** to the sensitive spot  of the sensor (at first both LEDs light up, after approx. 3 seconds the orange LED flashes 3 times, and after another approx. 2 seconds the orange LED flashes again 3 times - now you can remove the magnetic pen. The sensor is now set to the mode C (opens when submerged).



If no other agreement the mode "O" is set on all sensors straight from the factory.





When using the function "Quick Settings", the sensor does not eliminate the presence of deposits and foam on the electrode. The manufacturer recommends performing Basic Settings as soon as possible.



6. 2. BASIC SETTINGS

For setting the sensitivity and switching mode, where it is possible to submerge the sensor in or remove it from the medium. When using this setting, the sensor eliminates the presence of deposits and foam on the electrode.

A) SETTING THE MODE O (IT IS CLOSED WHEN SUBMERGED)

1. Immerse the sensor electrode in the medium to be measured (in case of interface detection of two media, place the electrode into the lower medium).
2. Apply the magnetic pen for **2 - 4 seconds** to the sensitive spot  of the sensor (until both LEDs shine) and then remove the magnetic pen. Settings are confirmed by three flashes of the orange LED.
3. Pull the sensor out of the media. Leave possible deposits on the electrode (in case of interface detection, place the electrode to the upper medium).
4. Apply the magnetic pen for **2 - 4 seconds** to the sensitive spot  of the sensor (until both LEDs shine) and then remove the magnetic pen. Settings are confirmed by three flashes of the orange LED.
5. Check the state of indicators:
 - If the orange LED is dark and the green LED flashes, the sensor is correctly set.
 - If the orange and green LEDs flash alternatively, the sensor did not recognize the limits for closing and opening. In this case, find out whether the minimum and maximum levels are not set too close to one another.

B) SETTING THE MODE C (IT IS OPEN WHEN SUBMERGED)

1. Immerse the sensor electrode in the medium to be measured (in case of interface detection of two media, place the electrode into the lower medium).
2. Apply the magnetic pen for **2 - 4 seconds** to the sensitive spot  of the sensor (until both LEDs shine) and then remove the magnetic pen. Settings are confirmed by three flashes of the orange LED.
3. Pull the sensor out of the media. Leave possible deposits on the electrode (in case of interface detection of two media, place the electrode to the upper medium).
4. Apply the magnetic pen for **2 - 4 seconds** to the sensitive spot  of the sensor (until both LEDs shine) and then remove the magnetic pen. Settings are confirmed by three flashes of the orange LED.
5. Check the state of indicators:
 - If the orange LED shines and the green LED flashes, the sensor is correctly set.
 - If the orange and green LEDs flash alternatively, the sensor did not recognize the limits for closing and opening. In this case, find out whether the minimum and maximum levels are not set too close to one another and possibly repeat the settings.



For safety reasons, we recommend setting the mode "O" for level sensing (the sensor closes when submerged). A faulty sensor or wiring will take effect here in the same way as level emergency conditions by opening the sensor. Analogously, for the maximum level it is recommended to set the mode "C" (the sensor opens when submerged).

6. 3. SETTINGS "MEDIUM WINDOW" - MEDIA RESOLUTION FUNCTION

The sensor can also be used to distinguish a specific medium from others – using the "Medium window" function. E.g. the sensor can distinguish oil from water and air, detect only beer foam and ignore beer and air, etc. To set the sensitivity and switching mode for the required medium. With this setting, the sensor does not react to being submerged in a medium with a different permittivity.

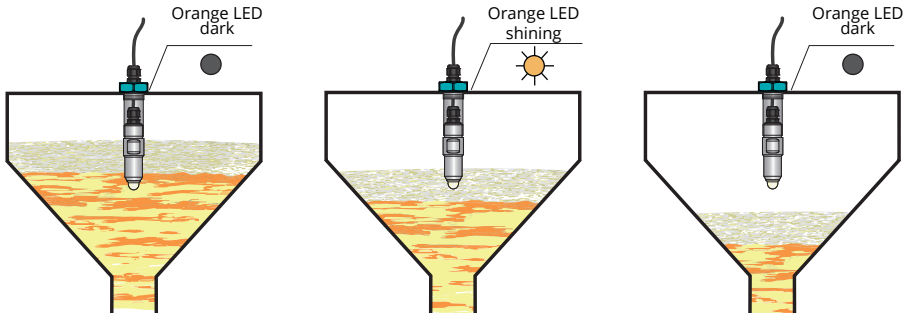


Fig. 2: Mode "Medium window" - only detection of required medium:
(e.g.: only beer foam, beer and air are ignored)

A) SETTING THE MODE O (SENSOR CLOSES WHEN SUBMERGED IN THE REQUIRED MEDIUM)

1. Immerse the sensor electrode in the medium to be measured.
2. Apply the magnetic pen for **at least 10 seconds** to the sensitive spot **ON** of the sensor (at first both LEDs light up, after approx. 3 seconds the orange LED flashes 3 times, and after another approx. 2 seconds the orange LED flashes again 3 times - now you can remove the magnetic pen.
The sensor is now set to mode O (closes when submerged in the required medium).
3. Check the state of indicators:
 - If the orange LED shines and the green LED flashes, the sensor is correctly set.

B) SETTING THE MODE C (SENSOR OPENS WHEN SUBMERGED IN THE REQUIRED MEDIUM)

1. Immerse the sensor electrode in the medium to be measured.
2. Apply the magnetic pen for **at least 10 seconds** to the sensitive spot **OFF** of the sensor (at first both LEDs light up, after approx. 3 seconds the orange LED flashes 3 times, and after another approx. 2 seconds the orange LED flashes again 3 times - now you can remove the magnetic pen.
The sensor is now set to mode C (opens when submerged in the required medium).
3. Check the state of indicators:
 - If the orange LED is dark and the green LED flashes, the sensor is correctly set.

6.4. SETTING USING THE W PROGRAMMING WIRE

With the variants provided with the remote parametrization option (RFLS-28_--_--PD_MW), it is possible to set the sensor using the **W** programming wire, or a special evaluation unit SSU-1212-AD, respectively. This unit is equipped with a contact (terminal No. 7) to connect the programming wire allowing the **basic settings** of the sensor to be performed. Quick settings as per paragraph 6.1.1 or the setting of the “Medium window” mode as per paragraph 6.1.3 is not possible.

6.4.1. EVALUATION UNITS SSU-1212-AD

The unit has one input for the connection of the operating sensor (marked as IN, terminal No. 3). The operating sensor enables the control of the operating relay (terminals 14, 15, 16). The unit is fitted with the diagnostic function monitoring the correct operation of the connected sensor, and the remote parametrization function for the connected sensor using the **W** programming wire. The programming wire is connected to the terminal marked as P (terminal No. 7).

FRONT PANELS AND NUMBERING OF TERMINALS

Indication LED - SSU-1212-AD

Green “POWER”

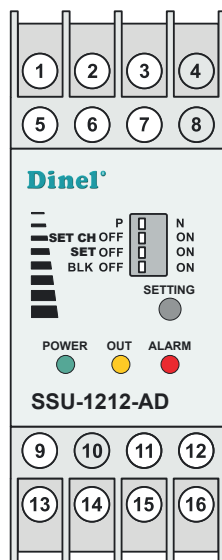
- **light** – connection of the 230 VAC power supply, correct function
- **dark** – failure (short circuit on the power supply terminals)

Orange “OUT”

- **light** – output relay activated, contacts 15, 16 closed
- **dark** – output relay deactivated, contacts 14, 15 closed
- **flashing** – sensor setting acknowledgement

Red “ALARM”

- **light** – emergency relay deactivated, contacts 11, 12 open
- **dark** – emergency relay activated, contacts 11, 12 closed



DESCRIPTION OF SETTING ELEMENTS

by the “P / N” switch

- **P position** – the unit reacts to the current entering the input terminal (No. 3) for the PNP-type sensors

N position – the unit reacts to current leaving the input terminal (No. 3)

for the NPN-type, “S”, and Namur sensors, or those with voltage-free contact output

by the “SET CH OFF / ON” switch

- **OFF position** – the setting function of the sensor connected to the IN terminal (No. 3) deactivated
- **ON position** – the setting function of the sensor connected to the IN terminal (No. 3) activated

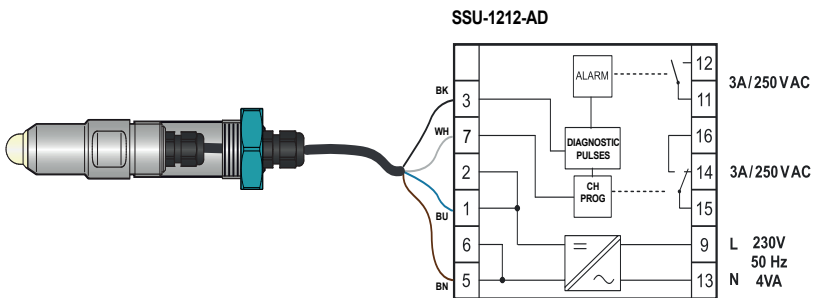
by the “SET OFF / ON” switch

- **OFF position** – setting the sensor opening
- **ON position** – setting the sensor closing

by the “BLK OFF / ON” switch

- **OFF position** – status of the emergency relay has no impact on the status of the operating relay
- **ON position** – emergency status of the emergency relay locks the operation of the operating relay and deactivates it – contacts 15, 16 open

6.4.2 CONNECTING THE SENSOR TO THE EVALUATION UNIT



PNP output type sensor connection

+U sensors	terminal No. 5 or 6
Q output of the sensor	terminal No. 3
0 V of the sensor	terminal No. 1 or 2
programming wire	terminal No. 7

Legend

BK	black
WH	white
BU	blue
BN	brown

6.4.3 BASIC SETTINGS OF THE SENSOR USING THE SSU-1212-AD UNIT

The function suitable for setting the sensor to simple sensing or resolution of the interface of two media (see p. 4). For setting the sensitivity and switching mode, where it is possible to submerge the sensor in or remove it from the medium. When using this setting, the sensor eliminates the presence of deposits and foam on the electrode.

A) SETTING THE “O” MODE (CLOSES WHEN SUBMERGED)

1. Immerse the sensor electrode in the medium to be measured.
2. Switch the SET CH a SET switches to the ON position
3. Press the setting button (SETTING). Settings are confirmed by three flashes of the orange LED.

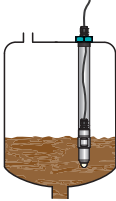



4. Pull the sensor out of the media. Leave possible deposits on the electrode.
5. Switch the SET switch to the OFF position
6. Press the setting button (SETTING). Settings are confirmed by three flashes of the orange LED.
7. Check the state of the ALARM indicator. If the red LED is not flashing, the sensor is set correctly. If it is flashing, the sensor is set incorrectly. Repeat the setting.



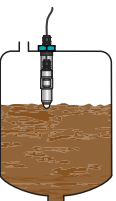

B) SETTING THE C MODE (OPENS WHEN SUBMERGED)

1. Immerse the sensor electrode in the medium to be measured.
2. Switch the SET CH switch to the ON position and the SET switch to the OFF position
3. Press the setting button (SETTING). Settings are confirmed by three flashes of the orange LED.
4. Pull the sensor out of the media. Leave possible deposits on the electrode.
5. Switch the SET switch to the ON position
6. Press the setting button (SETTING). Settings are confirmed by three flashes of the orange LED.
7. Check the state of the ALARM indicator. If the red LED is not flashing, the sensor is set correctly. If it is flashing, the sensor is set incorrectly. Repeat the setting.

SETTING MODES

The sensor can be set to normally closed "O-mode" or to normally open "C-mode" switch types.

	level state	mode	output state	Orange LED
minimum level sensing		O	CLOSED	 (shining)
		O	OPEN	 (dark)

	level state	mode	output state	Orange LED
maximum level sensing		C	CLOSED	 (shining)
		C	OPEN	 (dark)

For safety reasons, for scanning min. level, we recommend you to use the "O" mode setting (sensor closes when submerged). A faulty sensor or wiring will take effect here in the same way as level emergency conditions by opening the sensor. Analogously for the max. level, we recommend you to set the "C" mode (sensor opens when submerged).

7. SETTING ELEMENTS

The RFLS-28 switch can be set in two ways, namely using the magnetic pen **M** (variants RFLS-28 _ _ _-P- _-M, RFLS-28 _ _ _-PD- _-M a RFLS-28 _ _ _-PD- _-MW) or the programming wire **W** (variant RFLS-28 _ _ _-PD- _-MW). Remote parametrization only allows basic settings (interface of two media).

For variants without the remote parametrization option, setting must be provided before the sensor is installed in the tank. This setting is performed by placing the magnetic pen on sensitive spots marked as (M) /ON or (M) /OFF located on the sensor enclosure in the following modes:

- **Quick settings** - the user does not know precisely to what medium the sensor should be set, he only wants to put the sensor into operation (usually upon receiving it) and check to see if the sensor is generally functional.
- **Basic settings** - the user has the medium available and can perform on the sensor its flooding and drainage.
- **Medium window settings** - the user has the medium available and can perform on the sensor its flooding and drainage.

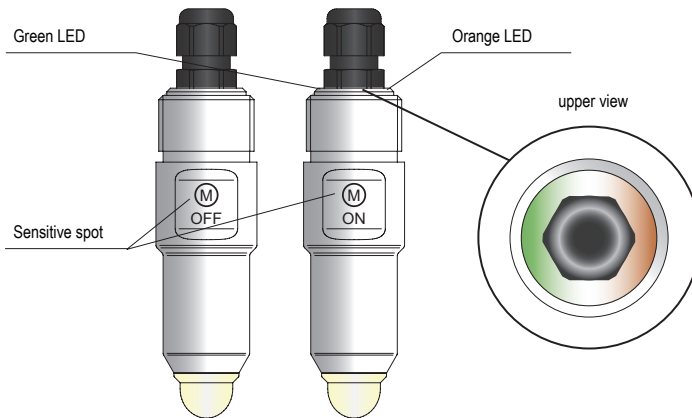


Fig. 3: RFLS-28 sensor setting up

8. FUNCTION AND STATUS INDICATION

LED indicator	colour	function
"RUN"	green	<p>Measuring function indication</p> <p>flashing – (approx. 0.4 s) – correct function of level detection</p> <p>dark – incorrect installation or malfunction.</p> <p>alternating flashing of the green and orange LED – error in settings</p> <p>simultaneous shine of green and orange LED – when applying the mag. pen, when the setting is confirmed</p>
"STATE"	orange	<p>Settings indication</p> <p>permanent shine – the sensor is closed</p> <p>dark – the sensor is open</p> <p>3 short flashes – settings confirmed</p> <p>alternating flashing of the green and orange LED – error in settings</p> <p>simultaneous shine of green and orange LED – when applying the mag. pen, when the setting is confirmed</p>

9. MECHANICAL MOUNTING

The RFLS-28 level sensor is designed for vertical installation in tanks and reservoirs.

With the TN-28 extension tube, which is available in three process connection variants (flange, G1" thread or TriClamp), it can be extended to the required length.

Installation instructions:

- Before installing the sensor in the tank, it is first necessary to set it - see Chapter 8
- If the sensor is set up, you will proceed to its installation in the TN-28 extension tube.
- First, the cable is passed through the extension tube and then the RFLS-28 sensor is screwed into the pipe.
- The complete assembly with the selected process connection is attached to the tank.

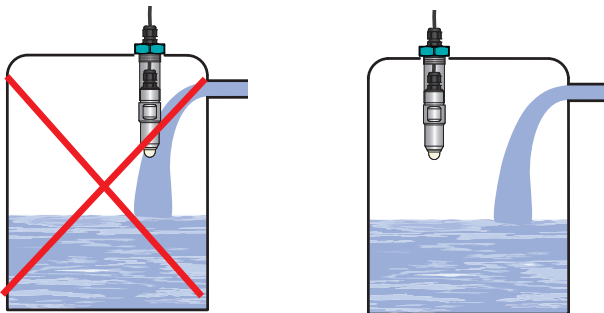


Fig. 4: Installation of the level meter out of the reach of filling flow



When installing the sensor in a metal tank or reservoir, the housing is not necessary to be grounded separately.



In the case of the use for an aggressive medium is necessary to prove the chemical compatibility of the materials, from which the sensor is made (see Tab. Used materials on p. 18). Any chemical damage is not covered by the warranty.

10. SENSOR VARIANT WITH OUTPUT "PD" WITH DIAGNOSTIC

The sensor type RFLS-35_--_--PD has a diagnostic built in its firmware with which it monitors its functional reliability. In order for the diagnostic to be active, i.e. the error notification to be indicated even if the control or output circuit is not functional, the microprocessor generates short pulses to the output signal, the so-called diagnostic pulses. Negative pulses are generated when the output is closed and positive pulses are generated when the output is open. This ensures faultless operation of all HW and SW components of the sensor.

10.1. DIAGNOSTIC MODES

The diagnostic has one mode of error-free operation and three modes indicating a malfunction or incorrect setting.

10.1.1. CORRECT MEASUREMENT

INDICATION: - **green** LED flashes (approx. 0.4 s)
- **orange** LED: when the output is closed, the LED shines
when the output is open, the LED is dark

OUTPUT: a 300 μ s wide pulse with a period of **30 ms** is generated into the output signal

SENSOR STATUS: the diagnostic does not indicate any problem, the measuring curve and the sensor settings are correct

10.1.2. INCORRECT SETTING

INDICATION: alternating flashing **green and orange** LEDs

OUTPUT: a 300 μ s wide pulse with a period of **20 ms** is generated into the output signal

SENSOR STATUS: the measuring curve is OK, but the sensor setting is incorrect (decision levels are close to each other)

10.1.3. INCORRECT MEASUREMENT

INDICATION: - **green** LED is dark
 - **orange** LED: in the event of closed output the LED shines with periodic dimming (0.1 s)
 in the event of open output the LED is dark with periodic lighting up (0.1 s)

OUTPUT: a pulse with a width of 300 us with a period of **10 ms** is generated into the output signal

SENSOR STATUS: the sensor setting is OK, but the diagnostic indicates a problem with the measuring curve, which can be caused by a failure of any element of the sensor

10.1.4. ANOTHER FAILURE OF SENSOR

INDICATION: the state of both LEDs cannot be specified, as their function may be affected by a control circuit error

OUTPUT: **the sensor does not generate any diagnostic pulses in the output signal**

SENSOR STATUS: either it is a fault in the control circuit or a failure in the output part of the electrical circuit and these faults can be diagnosed only by a special version of the SSU-1212-D

10.2. EVALUATION UNIT

A special unit SSU-1212-D is designed for the evaluation of diagnostic modes, which can evaluate the pulses generated by the sensor. It does not matter what state the sensor output is in (closed or open). Based on the period of the generated pulse, the unit determines in which diagnostic mode the sensor is and communicates information to the user.

10.3. FUNCTION AND STATUS INDICATION WITH DIAGNOSTIC

<i>LED indicator</i>	<i>colour</i>	<i>function</i>
"RUN"	green	<u>Measuring function indication</u> flashing – (approx. 0.4 s) – correct function of level detection dark – incorrect installation or malfunction. alternating flashing of the green and orange LED – error in settings simultaneous shine of green and orange LED – when applying the mag. pen, when the setting is confirmed
"STATE"	orange	<u>Settings indication</u> permanent shine – the sensor is closed dark – the sensor is open 3 short flashes – settings confirmed alternating flashing of the green and orange LED – error in settings simultaneous shine of green and orange LED – when applying the mag. pen, when the setting is confirmed periodic extinction (0,1 s) in closed mode - diagnosed function error periodic lighting (0,1 s) in open mode - diagnosed function error

11. ORDER CODE

ORDER CODE														
RFLS-28														
PERFORMANCE														
N non-explosive areas														
ELECTRODE TYPE														
1B insulated electrode (PEEK, NBR O-ring)														
10B insulated electrode (PEEK, NBR O-ring) with protective crown														
1E insulated electrode (PEEK, EPDM O-ring)														
10E insulated electrode (PEEK, EPDM O-ring) with protective crown														
1V insulated electrode (PEEK, FPM O-ring (Viton))														
10V insulated electrode (PEEK, FPM O-ring (Viton)) with protective crown														
PROCESS CONNECTION														
G³/₄ pipe thread G ³ / ₄ "														
OUTPUT OF TYPE														
P PNP (open collector)														
PD PNP (open collector) with diagnostic ¹⁾														
TYPE OF ELECTRICAL CONNECTION														
B standard plastic cable gland														
V standard plastic cable gland with spiral														
H plastic cable gland for protecting hose														
SETTING														
B magnetic pen														
MW programming wire and magnetic pen														
CABLE														
K cable length in m														
RFLS-28	N	-	1B	-	G ³ / ₄	-	P	-	B	-	M	-	K	AVAILABLE VARIANT OF THE PRODUCT

1) The evaluation units SSU-1212-D and SSU-1212-AD are used to evaluate the diagnostic signal. For the variant with the possibility of remote parameterization, it is necessary to use the evaluation unit SSU-1212-AD. These units will go on sale in the first half of 2021.

12. ACCESSORIES

magnetic pen (1 pc)	included in the price	MP-8	
O-ring (NBR, EPDM, FPM/Viton), (1 pc)	included in the price		
extension tube	at extra cost	TN-28-P (flange) TN-28-Z (G1" thread) TN-28-Cl (Tri-Clamp)	
cable over 2 m	at extra cost		
protecting hose (for cable gland H)	at extra cost		

13. SAFETY, PROTECTION AND COMPATIBILITY

The level sensor is equipped with protection against electric shock on the electrode, reverse polarity, output current overload, short circuit and against current overload on output.

Protection against dangerous contact is provided by low safety voltage according to HD 60364-4-41. Electromagnetic compatibility is provided by conformity with standards EN 55011/B, EN 61326-1, EN 61000-4-2 to -6 and -8.

A declaration of conformity was issued for this device in the wording of Act No. 90/2016 Coll., as amended. Supplied electrical equipment matches the requirements of valid European directives for safety and electromagnetic compatibility.

14. FUNCTIONAL SAFETY

The high-frequency level sensors RFLS-35 meet the safety integrity level requirements according to standard EN 61508. The sensors are intended for level height detection applications of liquid and pasty media with increased safety demands in modes:

- Overfill protection
- Dry run protection

In both modes, the sensors meet the requirements for functional safety at level SIL 2.

The sensor electronics have 1oo1 architecture (according to the output variant single-channel without P (R) diagnostics, or single-channel with PD diagnostics).

It is recommended to perform a function test of the sensor's safety function 1 per year.

15. USE, MANIPULATION, AND MAINTENANCE

The level meter does not require any personnel for its operation. Maintenance of this equipment consists in verification of integrity of the level meter and of the supply cable. Cleaning or sterilization of the sensor (CIP / SIP) is possible under the conditions specified in the technical specifications.



It is forbidden to make any changes or interventions to the RFLS-28 sensor without the consent of the producer. Any repairs must only be carried out by the producer or authorized service organisations.

Assembly, installation, commissioning, service and maintenance of the RFLS-28 level sensor must be carried out in accordance with this manual and the provisions of valid standards for the installation of electrical equipment must be complied with.

Activity during the operation:

- If the sensor is connected to the automatic control system or to emergency signalling, it must not be infringed in its setting during the operation.
- If a change of the sensor settings is necessary, the whole system must be temporarily switched off and the process held in a safe condition using other means and measures.
- Signalling of failure conditions is described in chapter 9. *Function and status indication* or chapter 10.3. *Function and status indication with diagnostic*.

Activity in case of a failure:

- In the event of detected faults or fault signals, the whole system must be shut down and the process held in a safe condition using other means and measures.
- If the replacement of the sensor is needed due to the fault, it is necessary to notify the manufacturer (including a description of the fault).

Repairs of the sensors:

If you need to send the sensor for repair, proceed as follows:

- Remove and clean the sensor or perform its decontamination and wrap it well.
- Write a description of the fault as detailed as possible, attach also a detailed description of the application and of the installation location and everything together with the sensor send please to the address of Dinel s.r.o. company.
- Please provide maximum synergy in finding the root cause of the fault. Your satisfaction is our top priority!

16. PUTTING OUT OF OPERATION OR DISPOSAL

Disassembly:

Before commencing disassembly, consider possible risks, such as for example pressure in the tank, high temperatures, corrosive properties or toxicity of products, etc.

Carefully read the product manual chapter "Installation instructions" and "Electrical connection" and perform the described steps in reverse sequence.

Disposal:

The high-frequency level sensors RFLS-35 are made from materials that can be recycled by specialised companies. Mark the device as waste and dispose of it according to the respective government directive for handling electronic waste. Materials: see "Technical specifications".

17. GENERAL CONDITIONS AND WARRANTY

The manufacturer guarantees from the supply that this product will have established properties given in the technical conditions for a period of 3 years.

The manufacturer is responsible for the faults that have been identified during the warranty period and were claimed in writing.

The warranty does not apply to defects resulting from improper handling or failure to comply with the technical specifications.

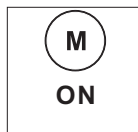
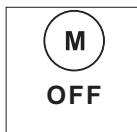
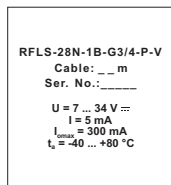
The warranty shall expire if the customer or a third party carries out changes or modifications of the product, if the product is mechanically or chemically damaged, or if the production number is not legible.

For the application of a claim, it is necessary to submit the certificate of warranty.

In the event of justified complaint, we repair the defective product, or replace it with a new one. In both cases, the warranty period shall be extended by the time of the repair.

18. MARKING OF LABELS

Data on label for the sensor series **RFLS-28N-__-P-__**



Symbol of producer: Dinel[®] logo

Internet address: www.dinel.cz

Country of origin: Made in Czech Republic

Level meter type: RFLS-28N-__-P-__

Cable length: Cable: __ m

Serial number of the product: No.: _____ - (from the left: production year, serial production number)

Supply voltage: U = 7 ... 34 V =

Supply current: I = 5 mA

Maximum output current: I_{max} = 300 mA

Ambient temperature range: t_a = -40 ... +80 °C

Protection class: IP68

Compliance mark: CE

Electro-waste take-back system mark:



The size shown does not correspond to reality.

19. TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS		
Supply voltage		7 ... 34 V DC
Power consumption		max. 5 mA DC
Max. switching current (PNP output)		300 mA
Residual voltage - ON state		max. 1.5 V
Coupling capacity (housing – power) / dielectric strength		5 nF / 500 V AC (50 Hz)
Protection class	type RFLS-28N-__-G ³ / ₄ -P-__	IP 68
Cable (versions with cable outlets)		PVC 3 x 0.5 mm ²
Weight (without cable)		approx. 0.15 kg
Minimum relative permittivity		$\epsilon_r = 1.5$
Minimum distance of the electrode from the vessel wall	type el. 1	20 mm
	type el. 10	10 mm

MATERIALS		
part of the sensor		standard material *
Housing (case)		stainless steel W.Nr. 1.4404 (AISI 316L)
Enclosure		polycarbonate
Electrode coating	type el. 1, 10	PEEK
O-ring seal	RFLS-28_-1B, 10B	NBR
	RFLS-28_-1E, 10E	EPDM
	RFLS-28_-1V, 10V	FPM (Viton)
Cable gland (variant "B", "V", "H")		PA / NBR plastics

Verify chemical compatibility with the media. Upon agreement it is possible to select a different type of material.

PARAMETERS OF FUNCTIONAL SAFETY

variant of sensor	RFLS-28N-_-_-P	RFLS-28N-_-_-PD
according to standard	EN 61508 ed.2	
Safety function	MIN, MAX	
SIL	2	
Hardware architecture	1oo1 without diagnostic	1oo1 with diagnostic
DC	0 %	99 %
PFH ($T_{Proof} = 1 \text{ rok}$) (for variant N)	$1,471 \cdot 10^{-7}$	$1,471 \cdot 10^{-9}$
λ_{DD} (for variant N)	0 FIT	145,6FIT
λ_{DU} (for variant N)	147,1 FIT	1,5 FIT
MTTF _D (for variant N)	776 years	
valid version FW	v2	v3-diagnostic

Explanations:

SIL Safety integrity level,

DC Diagnostic cover,

PFH..... Average frequency of dangerous failure per hour,

T_{Proof} Functional control period of the device safety function

$\lambda_{DD/DU}$ Detected (resp. undetected) dangerous failure rate per hour

MTTF_D..... Mean Time To dangerous Failure

PROCESS CONNECTION

name	dimension	marking
Pipe thread	G $\frac{3}{4}$ "	G $\frac{3}{4}$

MECHANICAL PERFORMANCE AND AREA CLASSIFICATION

(EN 60079-0, EN 60079-10-1)

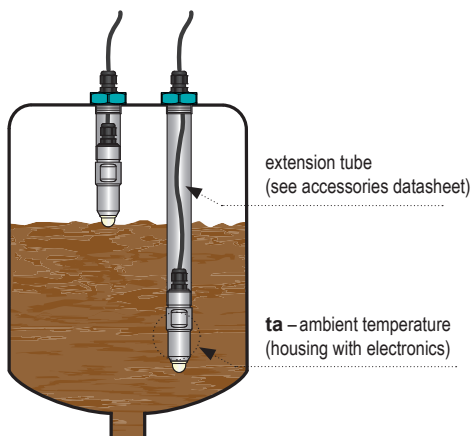
Sensor performance	electrode type	Device classification
RFLS-28N	All types	Basic performance for use in non-explosive areas.

FACTORY DEFAULT

switching mode	O (closes when submerged)
sensitivity	for water sensing

TEMPERATURE AND PRESSURE DURABILITY – variant N

performance variant	ta temperature	maximum overpressure
RFLS-28N-1B (1E, 10B, 10E)	-40°C ... +80°C	10 MPa
RFLS-28N-1V (10V)	-20°C ... +80°C	10 MPa



20. PACKING, SHIPPING AND STORAGE

The device RFLS–28 is packaged in a polyethylene bag, and the entire consignment is placed into a cardboard box. A suitable filler material is used in the cardboard box to prevent mechanical damage during transport.

Remove the device from the packaging only just before using, thereby protecting it from potential damage.

A forwarding company will be used to ship goods to the customer. Upon prior agreement, ordered goods can be picked up in person at company headquarters. When receiving, please check to see that the consignment is complete and matches the order, or to see if any damage has occurred to the packaging and device during transport. Do not use a device clearly damaged during transport, but rather contact the manufacturer in order to resolve the situation.

If the device is to be further shipped, it must be wrapped in its original packaging and protected against impact and weather conditions.

Store the device in its original packaging in dry areas covered from weather conditions, with humidity of up to 85 % without any effects of chemically active substances. The storage temperature range is -10°C to +50°C.